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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/912,720	07/24/2001	David A. Foti	04899-052001	5512

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EXAMINER	
KANG, INSUN	

ART UNIT	PAPER NUMBER
2193	

DATE MAILED: 02/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/912,720	FOTI, DAVID A.	
	Examiner	Art Unit	
	Insun Kang	2193	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 October 2005 and 09 December 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to the amendment filed 10/21/2005 and 12/9/2004.

2. As per applicant's request, claims 31-45 have been cancelled and claims 1, 3, 4, 6, 15, 16, 18, 19, 21, and 30 have been amended. Claims 1-30 are pending in the application.

Oath/Declaration

3. The Oath/Declaration has been acknowledged.

Specification

4. The objection to the specification has been withdrawn due to the amendment to the specification.

Claim Objections

5. The objection to claims 16-30 has been withdrawn due to the amendment to the claims.

Claim Rejections - 35 USC § 112

6. The rejection to claims 1-14 and 16-29 has been withdrawn due to the amendment to the claims.

Claim Rejections - 35 USC § 101

7. The rejection to claims 1-15 has been withdrawn due to the amendment to the claims.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. Claims 4-13 and 15-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Houldsworth (US Patent 6,502,110).

Per claim 15:

Houldsworth discloses:

- detecting deletion of a reference to a candidate object ("reclaiming memory space allocated to data structures...by identifying pointers," abstract)
- determining a number of cyclic paths that include said candidate object in the object-oriented programming environment("a cycle of the first system may be interleaved between cycles of the second system; a first number of cycles of the first system are interleaved between a second number of cycles of the second system. A global indicator may dictate from which system the next memory reclamation cycle will be derived," col. 2 lines 52-61)
- determining a number of internal references to said candidate object, wherein internal references are references from other objects in the object-oriented programming environment ("The bits represent a reference count of references from each direction in the heap," col. 6 lines 23-40)

- controlling disposition of said candidate object on the basis of a defined relationship between said number of internal references and said number of cyclic paths ("Whilst the in above description reference counting is performed during the reference-sweep cycle, the reference counting could alternatively, or in addition, be performed during the mark-sweep cycle. This would mean in the above example that objects 540 and 530a are reclaimed one cycle earlier," col. 6 lines 41-47) as claimed.

Per claim 4, it is another method version of claim 15, respectively, and is rejected for the same reasons set forth in connection with the rejection of claim 15 above.

Per claim 5:

The rejection of claim 4 is incorporated, and further, Houldsworth teaches:

- reading an internal-reference count (col. 1 lines 40-50) as claimed.

Per claim 6:

The rejection of claim 4 is incorporated, and further, Houldsworth teaches:

- identifying a referred object that lies on a path containing a reference originating at said candidate object; determining a fourth value indicative of a number of references to said referred object that originate at other objects the object-oriented environment, said fourth value being associated with said referred object; and determining a fifth value indicative of the number of cyclic paths to said candidate object that pass through said

referred object, said fifth value being associated with said referred object (col. 2 lines 52-61) as claimed.

Per claim 7:

The rejection of claim 6 is incorporated, and further, Houldsworth teaches:

-initializing a sixth value associated with said referred object, said sixth value being indicative of a number of cyclic paths known to include said candidate object and said referred object; and adjusting said sixth value if said referred object has a reference directly to said candidate object (col. 2 lines 52-61) as claimed.

Per claim 8:

The rejection of claim 7 is incorporated, and further, Houldsworth teaches:

- identifying a referring object having a reference to said referred object; and detecting a defined relationship between said fifth value and said sixth value associated with said referred object, adjusting a seventh value associated with said referring object in response to detection of said defined relationship, said seventh value being indicative of a number of known cyclic paths that include said candidate object and said referring object (col. 2 lines 45-67) as claimed.

Per claim 9:

The rejection of claim 8 is incorporated, and further, Houldsworth teaches:

- determining that said fifth value and said sixth value are equal to each other (col. 7 lines 16-25) as claimed.

Per claim 10:

The rejection of claim 8 is incorporated, and further, Houldsworth teaches:

- adjusting said seventh value by an amount corresponding to said sixth value (col. 7 lines 16-25) as claimed.

Per claim 16, it is the computer-readable medium version of claim 15, respectively, and is rejected for the same reasons set forth in connection with the rejection of claim 15 above.

Per claims 19-25, they are the computer-readable medium versions of claims 4-10, respectively, and are rejected for the same reasons set forth in connection with the rejection of claims 4-10 above.

Per claim 29:

The rejection of claim 16 is incorporated, and further, Houldsworth teaches:

- determining whether said candidate object is referenced from outside of a tree; and marking said candidate object for preservation if there exists a reference to said candidate object from a tree (col. 40-61) as claimed.

Per claim 30, it is the computer-readable medium version of claim 15, respectively, and is rejected for the same reasons set forth in connection with the rejection of claim 15 above.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 1-3, 11-14, 17, 18, and 26-28 are rejected under 35 U.S.C. 102(e) as being unpatentable over Houldsworth (US Patent 6,502,110) in view of the disclosure in the background section of Houldsworth (hereafter Wilson).

Per claim 1:

Houldsworth discloses determining a first value indicative of a number of references to said candidate object from other objects (i.e. col. 2 lines 27-40). Houldsworth does not explicitly teach the data structure is traversed to identify the number of references to the candidate object that are not references from other objects.

However, Houldsworth states in the background section, Wilson's garbage collection technique that "involves first marking all stored objects that are still reachable by other stored objects or from external locations by tracing a path or paths through the pointers linking data objects (col. 1 lines 27-35) teaches was known in the pertinent art, at the

time applicant's invention was made, to reclaim unreachable objects from external locations. It would have been obvious for one having ordinary skill in the pertinent art of to modify Houldsworth's disclosed system to incorporate the teachings of Wilson. The modification would be obvious because one having ordinary skill in the art would be motivated to free unreachable objects from external locations as the garbage collector must identify pointers directly accessible to the executing program as well as references contained within the object (col. 1 lines 27-35).

Per claim 2:

The rejection of claim 1 is incorporated, and further, Houldsworth teaches:

-determining a first value comprises reading an external-reference count (i.e. col. 1 lines 27-35) as claimed.

Per claim 3:

The rejection of claim 1 is incorporated, and further, Houldsworth teaches:

-determining, on the basis of said first value, whether there exists at least one reference to said candidate object that is not from another object; and marking said candidate object for preservation if there exists at least one reference to said candidate object that is not from another object (i.e. col. 1 lines 27-35) as claimed.

Per claims 11-13, they are another method versions of claims 1-3 and 14, respectively, and are rejected for the same reasons set forth in connection with the rejection of claims 1-3 and 14 above.

Per claim 14:

The rejection of claim 1 is incorporated, and further, Houldsworth teaches:

- determining whether said candidate object is referenced from outside of a tree; and marking said candidate object for preservation if there exists a reference to said candidate object from a tree (col. 40-61) as claimed.

Per claims 17 and 18, they are the computer-readable medium versions of claims 2-3, respectively, and are rejected for the same reasons set forth in connection with the rejection of claims 2-3 above.

Per claims 26-28, they are the computer-readable medium versions of claims 11-13, respectively, and are rejected for the same reasons set forth in connection with the rejection of claims 11-13 above.

Response to Arguments

12. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection.

Therefore, this action is made non-final.

Per claim 4:

The applicant states that:

Houldsworth discloses at most that the first and second systems reclaim the memory allocated to objects based on the internal references to the objects and whether the objects are descendents of root objects.

Houldsworth does not disclose the relationship between the number of the internal references to the candidate object and the number of cyclic paths including the candidate object for destroying the candidate object. The cyclic paths of the claimed invention are the paths including the candidate object the disposition of which is controlled while the cycles of the first or the second system in Houldsworth cannot correspond to the cyclic paths of the claimed invention.

In response, Houldsworth discloses that a data structure is traversed to identify those objects to which the pointers of other objects make no references and objects not descendants of root objects are determined for memory reclamation. The memory space is traversed in a first direction during even numbered cycles and traversed in a second alternate direction (col. 2 lines 62-67) so that an "object found to be unreferenced by pointers of other objects in one direction and not having the mark from a prior traversal in the alternate direction may be deleted (col. 3 lines 1-5)." The data structure traversed is the cyclic path representing a chain of references between objects and therefore the reachability relationships. Therefore, the argument above is not persuasive.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Insun Kang whose telephone number is 571-272-3724. The examiner can normally be reached on M-F 7:30-4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on 571-272-3719. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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